PATENT ABSTRACTS OF JAPAN

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(54) PROCESS CHEESE AND ITS PRODUCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a process cheese free from melting salt, exhibiting excellent stringiness in heating and having smooth texture and good taste and flavor and provide a process for the production of the process cheese.
SOLUTION: A natural cheese having a maturity degree of ≤30% and prepared by using lactic bacterial producing polysaccharides is compounded to the other kind of cheese in an amount of ≥30% and the mixture is emulsified under heating without adding a melting salt to obtain the objective process cheese. A low-fat milk can be used as a raw milk for cheese to obtain a low-fat process cheese. A process cheese having high quality and capable of preventing excessive intake of phosphorus originating from melting salt can be produced by this process.

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]A manufacturing method of process cheese in which ******** outstanding at the time of heating characterized by carrying out heating emulsification without blending natural cheese of 30% or less of a degree-of-ripeness index prepared using lactic acid bacteria which produce a polysaccharide not less than 30%, and adding fused salt is shown.
[Claim 2]A manufacturing method of low-fat process cheese which shows ******** outstanding at the time of heating characterized by carrying out heating emulsification without 30% or less of a degree-of-ripeness index and a fat rate which were prepared using lactic acid bacteria which produce a polysaccharide blending 10 to 30% of natural cheese not less than 30%, and adding fused salt to low-fat milk.
[Claim 3]Process cheese in which ******** outstanding at the time of heating obtained by carrying out heating emulsification without blending natural cheese of 30% or less of a degree-of-ripeness index prepared using lactic acid bacteria which produce a polysaccharide not less than 30%, and adding fused salt is shown.
[Claim 4]Low-fat process cheese in which ******** outstanding at the time of heating obtained by carrying out heating emulsification without 30% or less of a degree-of-ripeness index and a fat rate which were prepared to low-fat milk using lactic acid bacteria which produce a polysaccharide blending 10 to 30% of natural cheese not less than 30%, and adding fused salt is shown.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Without adding fused salt, this invention has a smooth organization produced by carrying out heating emulsification, is good and relates to process cheese in which ******** outstanding at the time of heating is shown, and a manufacturing method for the same. [flavor's]
[0002]
[Description of the Prior Art]Process cheese grinds the natural cheese used as a raw material, adds fused salt, such as sodium phosphate, to this, carries out heating emulsification, prepares a homogeneous emulsified matter, and is obtained by cooling. It is exchanged for the calcium ion by which it was placed between the casein coagulation of natural cheese, and the sodium ion of the fused salt added at the time of emulsification divides relation of casein. By giving moderate warming and stirring here, a fat is uniformly mixed with protein. Thus, when carrying out heating emulsification of the ground natural cheese by manufacture of process cheese from the former, emulsification of a fat and protein is promoted, and fused salt is added in order to stabilize an emulsified state. The method of manufacturing process cheese, without adding fused salt is also reported. () [**** and] The process cheese which Snow Brand R&D Report 96,225 (1992) manufactured without adding fused salt, Mouthfeel when it eats lacks in smoothness, it is easy to become a weak and hard organization, an emulsified state becomes unstable also in the case of manufacture, and it is easy to produce fat separation and water-repelling. Therefore, it is indispensable to add fused salt by manufacture of process cheese from the former.
[0003]On the other hand, on nutrition, in the fixed range with the balance of calcium:Lynn, although absorption of calcium is good, When the intake of Lynn increases and the balance of calcium:Lynn collapses, there is also a report (H. H. Draper and C. A. Scythes, Fed. Proc., 40,

and 2434 ('81)) that absorption of calcium is barred. Therefore, also nutritionally, to stop the amount of fused salt, especially the phosphate used is desired.

[0004]Since process cheese has functional characteristics, such as a smooth organization, good flavor, good melting nature at the time of cooking by heating further, and ********, the demand has also been extended firmly. What is necessary is just to lessen the addition of the fused salt added in the case of emulsification using a cheese head with the degree of ripeness low as a stock cheese, in order to give functional characteristics, such as good ******** at the time of heating, to process cheese. The ******** of a cheese head is dependent on the strength of the structure of the casein which exists in a cheese head.

If the structure of casein breaks by advance of aging, or addition of fused salt, ******** will also fall.

Therefore, good ******** can be given if process cheese is manufactured using a stock cheese with the low degree of ripeness. However, the process cheese produced by doing in this way turns into a scarce cheese head of flavor. On the other hand, if process cheese is manufactured using a stock cheese with the high degree of ripeness, the rich cheese head of flavor will be obtained, but ******** falls. If the addition of fused salt is lessened, good ******** can be given, but it becomes easy to produce fat separation and water-repelling at the time of emulsification.

[0005]The onset rate of an adult disease (called a lifestyle-related disease) is increasing in recent years with the increase in the fat consumption per one people. Although the low thing of the fat content is undesirably marketed also in process cheese from this that a fat catches too much, these low-fat type process cheese has the tendency for an organization to be weak, to become hard and to lack in smoothness.

[0006]

[Problem(s) to be Solved by the Invention]Although it is called for in such the actual condition that ******** good at the time of (1) cooking is shown in process cheese, not using (2) fused salt, that (3) flavors and an organization are good, and that it is (4) low fat further, Such process cheese is not yet provided. Therefore, this invention is the process cheese which carried out heating emulsification and was prepared without adding fused salt, and let it be SUBJECT to provide process cheese which has good ******** good at the time of heating, flavor, and organization, and a manufacturing method for the same. This invention is the low-fat process cheese which carried out heating emulsification and was prepared without adding fused salt, and let it be SUBJECT to provide process cheese of the low fat which has the same characteristic as the above, and a manufacturing method for the same.

[0007]

[Means for Solving the Problem]This invention persons paid their attention to a stock cheese used in the case of process cheese manufacture, as a result of inquiring wholeheartedly, in

order to solve an aforementioned problem. Namely, by using natural cheese prepared using lactic acid bacteria which produce a polysaccharide as a stock cheese, Even if it did not add fused salt, emulsification was performed good, process cheese moreover obtained showed ******** good at the time of heating, and it found out becoming flavor and good process cheese of an organization. The above-mentioned lactic acid bacteria were added using low-fat milk, and even if it used natural cheese prepared, it found out that low-fat process cheese with emulsification good even if it does not add fused salt, and good ********, flavor and an organization was obtained.

[0008]This invention relates to a manufacturing method of process cheese in which ******** outstanding at the time of heating carrying out heating emulsification is shown, without blending natural cheese of 30% or less of a degree-of-ripeness index prepared using lactic acid bacteria which produce a polysaccharide not less than 30%, and adding fused salt. This invention 30% or less of a degree-of-ripeness index prepared to low-fat milk using lactic acid bacteria which produce a polysaccharide, It is related with a manufacturing method of low-fat process cheese in which ******** outstanding at the time of heating carrying out heating emulsification is shown, without a fat rate's blending 10 to 30% of natural cheese not less than 30%, and adding fused salt. This invention relates to process cheese in which ******** outstanding at the time of heating obtained by carrying out heating emulsification is shown, without blending natural cheese of 30% or less of a degree-of-ripeness index prepared again using lactic acid bacteria which produce a polysaccharide not less than 30%, and adding fused salt. This invention 30% or less of a degree-of-ripeness index prepared to low-fat milk using lactic acid bacteria which produce a polysaccharide, It is related with low-fat process cheese in which ******** outstanding at the time of heating obtained by carrying out heating emulsification is shown, without a fat rate's blending 10 to 30% of natural cheese not less than 30%, and adding fused salt.

[0009]By using lactic acid bacteria which produce a polysaccharide as lactic acid bacteria in this invention, when manufacturing a stock cheese, In order for a polysaccharide produced by lactic acid bacteria to form a matrix as an adhering object into the surface of cheese curd generated in a cheesemaking process, and a card, to join together by an interaction of polysaccharide and water and to win moisture in cheese curd, Moisture discharged by heating at the time of whey exclusion decreases, and soft cheese curd of an organization having contained many moisture is obtained. A polysaccharide delays SHINERISHISU of cheese curd in order to check a casein comrade's binding in cheese curd morphosis. The water retention of cheese curd goes up by operation of such polysaccharide, and structure will become loose. Therefore, a cheese head which ripened this cheese curd contains many moisture, since an organization is also soft, even if it does not add fused salt, emulsification is performed good and process cheese obtained also becomes a smooth thing of an organization. In order to

bring about such an effect, it is required in cheese curd to contain a polysaccharide 0.01% or more, and an effect is not acquired by less than it.

[0010]As mentioned above, ******** at the time of heating is dependent on strength of structure of casein in a cheese head, and ******** becomes good, so that structure of casein is firm. However, when many fused salt is added, ******** is made for it to be necessary to make quantity of fused salt added at the time of emulsification increase, or to make many moisture contain, when a cheese head with a structure of casein firm in this way is used, and to fall. Natural cheese manufactured on the other hand using lactic acid bacteria which produce a polysaccharide contains many moisture, it can fully emulsify, without adding fused salt, even if structure of casein is firm, if this cheese head is used since the organization is soft, and a good thing of ******** is obtained.

[0011]

[Embodiment of the Invention]Hereafter, this invention is explained in detail. The stock cheese used by this invention can be prepared as follows. First, milk fat of milk It adjusts to 0.5 to 4%, sterilizes at 63-75 **, it settles after that, cools to 30 **, and raw material milk is prepared. Here, if it is milk usually used for cheesemaking as "milk", which milk may be used, for example, whole milk, fat regulation milk, recombined milk, concentrated milk, butter milk, cream, or these mixtures can be mentioned.

[0012]To this raw material milk, they are about 0.05 to 4 % of the weight, and milk coagulating enzyme about a lactic starter. It adds 0.001 to 0.01% of the weight, milk is solidified at the temperature of 29-34 **, and cheese curd is obtained. in addition -- a lactic starter may be added for milk before sterilizing -- or the time of rennet addition -- warming in the case of whey exclusion -- the time -- the time of salting -- the time of mold stuffing, etc. -- proper -- it can carry out . As "lactic acid bacteria", as long as it is lactic acid bacteria which produce a polysaccharide, which lactic acid bacteria may be used here, For example, Lactobacillus helveticus (Lactobacillushelveticus), Lactobacillus DERUBURUKKI Subspecies bulgaricus (Lactobacillus delbrueckiisubsp. bulgaricus), Lactococcus lactis Subspecies Clemeau Rith (Lactococcus lactissubsp.cremoris) etc. can be used. As such lactic acid bacteria, they are Lactobacillus helveticus SBT2171 (accession number FERM P-10053) and Lactococcus lactis, for example. Subspecies Clemeau Rith SBT0495 (accession number FERM P-14381) etc. can be illustrated. In addition, it is usable if commercial lactic acid bacteria are also lactic acid bacteria which produce a polysaccharide. Can also use together the lactic acid bacteria usually used for manufacture of a cheese head, and to such lactic acid bacteria. Lactococcus lactis Subspecies RAKUCHISU (Lactococcus subsp.lactis), Lactococcus lactis subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris), Leuconostoc SHITOROBORUMU (Leuconostoccitrovorum), etc. can be mentioned. As "milk coagulating enzyme", as long as it is milk coagulating enzyme usually used for manufacture of a cheese head, which milk

coagulating enzyme may be used, and substitution rennet, transgenics rennet, etc. which were obtained from an animal, for example, a pig, and a microorganism, or vegetation besides rennet can also be used.

[0013]Subsequently, the obtained cheese curd is cut, for example so that it may become an about 10-40-mm-wide cube, quiet stirring is added, and SHINERISHISU (condensation) of cheese curd is promoted. Eliminating some whey produced when cheese curd was cut, and continuing stirring further, cheese curd is warmed at 30-38 **, and the whole quantity of the remaining whey is eliminated. Subsequently, salting is performed. As for salting, it may be preferred to consider it as 1 to 2% to the weight of cheese curd, and any of direct salting and brine salting may be sufficient as the salting method. After salting, a making machine is filled up with cheese curd and it is squeezed. Squeezing can be performed using the pressurization mold usually used in manufacture of a cheese head, a cautious type, or a vacuum type pressing machine. Subsequently, to 5 **, it cools and cheese curd is ripened. Aging can be performed by the same method as the usual natural cheese for one to six months at the temperature of 5-15 **.

[0014]Although the stock cheese of this invention can be manufactured as mentioned above, in this invention, the cheese head of 30% or less of a degree-of-ripeness index is used not less than 30%. The "degree of ripeness" (soluble nitrogen (STN) / total nitrogen (TN)) is what is called a degree-of-ripeness index (%) shown by x100 here. A degree-of-ripeness index measures the quantity of the total nitrogen contained in a cheese head, and soluble nitrogen in accordance with the following methods, and should just compute it based on the above-mentioned formula. Measurement of total nitrogen extracts the cheese head 10g, for example, adds 40 ml of 0.5N sodium acid citrate to it, is moved to a measuring flask after grinding for 5 minutes with a gay blender, and adds distilled water. The volume is set at 200 ml and let this be a sample solution. 10 ml of sample solutions can be extracted and it can measure with a Kjeldahl method. With distilled water after measurement of soluble nitrogen adds 10 ml of chloride of 1.41N to 10 ml of sample solutions The volume can be set at 125 ml, the generated protein sediment can be filtered, 10 ml of filtrate can be extracted, and soluble nitrogen can be measured with a Kjeldahl method. Since oil-off will be produced at the time not only of the structure of casein collapsing and sufficient ******** for the process cheese obtained not being given but emulsification if the degree-of-ripeness index of a stock cheese exceeds 30%, it is not desirable. In this invention, low-fat process cheese can be obtained by using raw material milk at the time of manufacturing a stock cheese as low-fat milk. It will be preferred to adjust to the fat rate of raw material milk and 0.5 - 1.4 %, and the fat rate of the cheese head prepared using such low-fat milk will be 10 to 30%.

[0015]Subsequently, process cheese is manufactured by using the obtained natural cheese as a stock cheese. What is necessary is just to perform manufacture of process cheese in

accordance with a publicly known method except not adding fused salt. For example, heating emulsification is kneaded and carried out by 30 - 3000 revolution per minute, feeding into an emulsion machine the stock cheese manufactured using the lactic acid bacteria which produce a polysaccharide as mentioned above, and heating to 70 - 100 **. At this time, publicly known emulsion machines, such as a kettle type, the Stephen type, and a thermostat cylinder type, can be used for an emulsion machine. Subsequently, a container can be suitably filled up with the obtained emulsified matter, and the process cheese of this invention can be obtained by carrying out cooling shaping. As for shaping, limitation in particular does not have tabular, block like shape, rod form, etc.

[0016]

[Example]

[Work example 1](1) Manufacture of a stock cheese (usually cheese head of a fat rate)

It selected two shares of six shares at a time from the three following strains among the lactic acid bacteria which produce a polysaccharide, and six sorts of stock cheeses were manufactured by making each of these stocks into a lactic starter. The used strain Lactobacillus helveticus (Lactobacillus helveticus) (SBT2171) (SBT23670), Lactobacillus DERUBURUKKI Subspecies bulgaricus (Lactobacillus delbrukiisubsp.bulgaricus) (SBT30089), It is (SBT30110) Lactococcus-lactis subspecies Clemeau Rith (Lactoccus lactissubsp.cremoris) (SBT25066) (SBT45226). After carrying out the several generation subculture of six shares of above-mentioned lactic acid bacteria in accordance with a conventional method, single bacillus culture was carried out as a starter. Fat regulation milk (fat content 3.0 % of the weight) sterilized at 75 ** for 15 seconds is cooled at 30 **, It is Lactococcus lactis as a lactic starter used for the usual cheesemaking. Subspecies RAKUCHISU (Lactococcuslactissubsp.lactis) 0.5% and the above-mentioned lactic starter It adds 0.5% respectively, Furthermore, it added, and gently, it stirred, rennet (made in KURICHAN Hansen; HA LA RENNET POWDER) was settled, and cheese curd was obtained. Cheese curd was shredded to die shape with the curd knife with a width of tooth of 10 mm, and whey was eliminated, heating and stirring gently until the temperature of goods became 38 **. Then, it was immersed in the salt of 20% concentration after pressing the obtained cheese curd, and was made to ripe for three months at 10 **. When the degree of ripeness of the obtained cheese head was checked, each degree-of-ripeness index was 15%.

[0017](2) Blending six sorts of natural cheese manufactured by manufacture (1) of process cheese at 0, 10, 20, 30, and 40 or 50% of the weight of a rate, respectively, using the cheddar cheese of 20% of a degree-of-ripeness index, the remainder considered it as 1000 kg of whole quantity, and obtained the stock cheese. Having supplied this to the kettle type emulsion machine, and stirring by 200 revolutions per minute, for about 10 minutes, heating emulsification was performed so that 85 ** might be made to reach, the emulsified matter was

obtained, carton was filled up, it cooled in the refrigerator and process cheese was obtained.
[0018]
[Comparative example 1] As lactic acid bacteria, it is Lactococcus lactis. 0.5% and rennet were added for subspecies RAKUCHISU (Lactococcuslactissubsp.lactis), and the cheese head was prepared according to working example 1. The degree-of-ripeness index of the cheese head was ripened for three months so that it might become 15%. Process cheese was manufactured for the remainder as Cheddar cheese of 20% of a degree-of-ripeness index, using the obtained cheese head 30%. Fused salt was not added at this time.
[0019]
[The example 1 of an examination] About the process cheese manufactured by working example 1 and the comparative example 1, evaluation of emulsifying aptitude and ******** and organic-functions evaluation (smoothness and flavor of an organization) were performed. The method of evaluation is shown below. Since the comparative example 1 did not add fused salt, emulsification was not performed good.
[0020]Emulsifying aptitude; the state of oil-off when a cheese head is emulsified was observed visually. What produced (O) and oil-off for the good thing of the emulsified state was made into (x).
********; ******** was performed by two kinds of methods shown below.
(I) The sauce for pizzas was thinly applied to the bread (5 cm x 5 cm) sliced to sandwiches, 10g of things [SHUREDDO / the cheese head of working example 1 / things / 0.5cmx1.5cm x0.2cm] were carried, and it heated for 2 minutes and 30 seconds within the oven of 240 **. After taking out from oven and settling for 30 seconds, this was cut in the half, it pulled mutually, and the state of the cheese head at that time was observed. The evaluation was performed on the following standard. Evaluation A: Many thread is also pulled finely and it is extended well. Evaluation B: Although some evaluation C:****** which do not pull many thread finely, either, although good ****** is shown are accepted, they have insufficiency and no evaluation D:******.
[0021](II) The cheese head 20g is extracted on a petri dish, by induction heater (90 **), this was heated for 1 minute and melting was carried out. Then, the petri dish was taken out promptly, it pulled up at the speed of 10 cm/s after 30-second neglect using hauling measuring apparatus, and length until thread snaps was measured. This examination was repeated 5 times and the maximum of these measured value was made into the central value. Length until it is the evaluations A and B and thread snaps by (II) by (I) from the above-mentioned (I) and the measurement result of (II) made rejection (x) what does not fulfill success (O) and this condition for a thing of 30 cm or more.
[0022]organic-functions evaluation; -- I get 30 persons' panelist to eat process cheese cheese-head 10g every -- the smoothness and the flavor of an organization -- five point: -- very

desirable four point: -- desirable three point: -- two point: which is not which, either -- it is not desirable -- is not [one : / five-step] very preferred evaluating -- the average mark -- a table -- the bottom. The 2nd place of the decimal point was rounded off. The above result is shown in Table 6 from Table 1.

[0023]

[Table 1]

Lactobacillus helveticus (SBT 2171) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	1.9
10	×	×	2.2	2.0
20	×	×	2.3	2.1
30	○	○	3.3	3.1
40	○	○	4.7	4.6
50	○	○	4.8	4.5

[0024]

[Table 2]

Lactobacillus helveticus (SBT 23670) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.0	1.9
10	×	×	1.8	1.9
20	○	○	2.3	2.1
30	○	○	3.3	3.1
40	○	○	4.7	4.7
50	○	○	4.8	4.6

[0025]

[Table 3]

Lactobacillus delbrueckii subsp. bulgaricus (SBT 30089) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.0	2.1
10	×	×	2.2	1.9
20	○	○	2.3	2.1
30	○	○	3.3	3.2
40	○	○	4.8	4.8
50	○	○	4.7	4.7

[0026]

[Table 4]

Lactobacillus delbrueckii subsp. bulgaricus (SBT 30110) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	2.2
10	×	×	1.9	2.0
20	×	×	2.4	2.2
30	○	○	3.2	3.1
40	○	○	4.8	4.8
50	○	○	4.7	4.7

[0027]

[Table 5]

Lactococcus lactis subs. cremoris (SBT 25066) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	2.2
10	×	×	1.9	2.0
20	○	○	2.4	2.2
30	○	○	3.2	3.1
40	○	○	4.8	4.8
50	○	○	4.7	4.7

[0028]

[Table 6]

Lactococcus lactis subs. cremoris (SBT 45226) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	1.9	2.2
10	×	×	2.0	2.1
20	○	○	2.2	2.3
30	○	○	3.2	3.2
40	○	○	4.7	4.8
50	○	○	4.8	4.6

[0029]

[Work example 2](1) Manufacture of a stock cheese (low-fat cheese head)
Through and the rate of milk fat to a separator fresh milk. It prepared so that it might become 1.0%. According to working example 1, fat manufactured 10% of stock cheese by making this into raw material milk. The used lactic acid bacteria were ripened for three months using Lactobacillus helveticus (Lactobacillus helveticus (SBT 2171)). The degree-of-ripeness index of the obtained cheese head was 15%.

[0030](2) 50% and a cheddar cheese (32% of fat rate) were added 50%, and the low-fat natural cheese (10% of fat rate) manufactured by manufacture (1) of process cheese was used as the stock cheese of 1000 kg of whole quantity. Process cheese was manufactured by the same method as (2) of working example 1.

[0031]

[The example 2 of an examination] Emulsifying aptitude, ********, the smoothness of an organization, and the valuation method same about flavor as the example 1 of an examination estimated. A result is shown in Table 7.

[0032]

[Table 7]

	評価項目			
	乳化適性	糸曳き性	風味	組織
本発明品	○	○	4.6	4.8

[0033]

[Work example 3](1) The natural cheese used as a raw material by the same method as manufacture working example 1 of a stock cheese was prepared. The used lactic acid bacteria used Lactobacillus helveticus (Lactobacillus helveticus (SBT 2171)). It was made to ripe at this time, so that the degree-of-ripeness index of a cheese head may be 20%, 25%, 30%, and 35%.

[0034](2) Blending the manufacture profitable **** natural cheese of process cheese 30%, the remainder obtained the stock cheese of 1000 kg of whole quantity using the cheddar cheese. Heating emulsification was carried out by the same method as working example 1, and process cheese was manufactured.

[0035]

[The example 3 of an examination] Emulsifying aptitude, ********, the smoothness of an organization, and the valuation method same about flavor as the example 1 of an examination estimated. The above result is shown in Table 8.

[0036]

[Table 8]

	評価項目			
熟度	乳化適性	糸曳き性	風味	組織
20	○	○	4.7	4.8
25	○	○	4.6	4.9
30	○	○	3.8	3.9
35	×	×	2.5	2.4

[0037]

[Effect of the Invention]According to this invention, even if it does not add fused salt at the time of heating emulsification, emulsification can be performed good, ******** good at the time of cooking can be shown, and an organization and the good process cheese of flavor can be obtained. Even if it uses low-fat milk for raw material milk, the low-fat process cheese good at the time of cooking which carried out heating emulsification without using fused salt with good flavor and organization which ******** can be provided. Since the cheese head of this invention

does not add fused salt at the time of emulsification, the tendency of superfluous ingestion of Lynn can also be controlled and it becomes possible to maintain the balance of calcium:Lynn at the fixed range.

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TECHNICAL FIELD

[Field of the Invention]Without adding fused salt, this invention has a smooth organization produced by carrying out heating emulsification, is good and relates to process cheese in which ******** outstanding at the time of heating is shown, and a manufacturing method for the same. [flavor's]

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PRIOR ART

[Description of the Prior Art]Process cheese grinds the natural cheese used as a raw material, adds fused salt, such as sodium phosphate, to this, carries out heating emulsification, prepares a homogeneous emulsified matter, and is obtained by cooling. It is exchanged for the calcium ion by which it was placed between the casein coagulation of natural cheese, and the sodium ion of the fused salt added at the time of emulsification divides relation of casein. By giving moderate warming and stirring here, a fat is uniformly mixed with protein. Thus, when carrying out heating emulsification of the ground natural cheese by manufacture of process cheese from the former, emulsification of a fat and protein is promoted, and fused salt is added in order to stabilize an emulsified state. The method of manufacturing process cheese, without adding fused salt is also reported. () [**** and] The process cheese which Snow Brand R&D Report 96,225 (1992) manufactured without adding fused salt, Mouthfeel when it eats lacks in smoothness, it is easy to become a weak and hard organization, an emulsified state becomes unstable also in the case of manufacture, and it is easy to produce fat separation and water-repelling. Therefore, it is indispensable to add fused salt by manufacture of process cheese from the former.
[0003]On the other hand, on nutrition, in the fixed range with the balance of calcium:Lynn, although absorption of calcium is good, When the intake of Lynn increases and the balance of calcium:Lynn collapses, there is also a report (H. H. Draper and C. A. Scythes, Fed. Proc., 40, and 2434 ('81)) that absorption of calcium is barred. Therefore, also nutritionally, to stop the amount of fused salt, especially the phosphate used is desired.
[0004]Since process cheese has functional characteristics, such as a smooth organization, good flavor, good melting nature at the time of cooking by heating further, and ********, the demand has also been extended firmly. What is necessary is just to lessen the addition of the fused salt added in the case of emulsification using a cheese head with the degree of ripeness low as a stock cheese, in order to give functional characteristics, such as good ******** at the

time of heating, to process cheese. The ******** of a cheese head is dependent on the strength of the structure of the casein which exists in a cheese head.
If the structure of casein breaks by advance of aging, or addition of fused salt, ******** will also fall.
Therefore, good ******** can be given if process cheese is manufactured using a stock cheese with the low degree of ripeness. However, the process cheese produced by doing in this way turns into a scarce cheese head of flavor. On the other hand, if process cheese is manufactured using a stock cheese with the high degree of ripeness, the rich cheese head of flavor will be obtained, but ******** falls. If the addition of fused salt is lessened, good ******** can be given, but it becomes easy to produce fat separation and water-repelling at the time of emulsification.
[0005]The onset rate of an adult disease (called a lifestyle-related disease) is increasing in recent years with the increase in the fat consumption per one people. Although the low thing of the fat content is undesirably marketed also in process cheese from this that a fat catches too much, these low-fat type process cheese has the tendency for an organization to be weak, to become hard and to lack in smoothness.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention, even if it does not add fused salt at the time of heating emulsification, emulsification can be performed good, ******** good at the time of cooking can be shown, and an organization and the good process cheese of flavor can be obtained. Even if it uses low-fat milk for raw material milk, the low-fat process cheese good at the time of cooking which carried out heating emulsification without using fused salt with good flavor and organization which ******** can be provided. Since the cheese head of this invention does not add fused salt at the time of emulsification, the tendency of superfluous ingestion of Lynn can also be controlled and it becomes possible to maintain the balance of calcium:Lynn at the fixed range.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Although it is called for in such the actual condition that ******** good at the time of (1) cooking is shown in process cheese, not using (2) fused salt, that (3) flavors and an organization are good, and that it is (4) low fat further, Such process cheese is not yet provided. Therefore, this invention is the process cheese which carried out heating emulsification and was prepared without adding fused salt, and let it be SUBJECT to provide process cheese which has good ******** good at the time of heating, flavor, and organization, and a manufacturing method for the same. This invention is the low-fat process cheese which carried out heating emulsification and was prepared without adding fused salt, and let it be SUBJECT to provide process cheese of the low fat which has the same characteristic as the above, and a manufacturing method for the same.

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MEANS

[Means for Solving the Problem]This invention persons paid their attention to a stock cheese used in the case of process cheese manufacture, as a result of inquiring wholeheartedly, in order to solve an aforementioned problem. Namely, by using natural cheese prepared using lactic acid bacteria which produce a polysaccharide as a stock cheese, Even if it did not add fused salt, emulsification was performed good, process cheese moreover obtained showed ******** good at the time of heating, and it found out becoming flavor and good process cheese of an organization. The above-mentioned lactic acid bacteria were added using low-fat milk, and even if it used natural cheese prepared, it found out that low-fat process cheese with emulsification good even if it does not add fused salt, and good ********, flavor and an organization was obtained.
[0008]This invention relates to a manufacturing method of process cheese in which ******** outstanding at the time of heating carrying out heating emulsification is shown, without blending natural cheese of 30% or less of a degree-of-ripeness index prepared using lactic acid bacteria which produce a polysaccharide not less than 30%, and adding fused salt. This invention 30% or less of a degree-of-ripeness index prepared to low-fat milk using lactic acid bacteria which produce a polysaccharide, It is related with a manufacturing method of low-fat process cheese in which ******** outstanding at the time of heating carrying out heating emulsification is shown, without a fat rate's blending 10 to 30% of natural cheese not less than 30%, and adding fused salt. This invention relates to process cheese in which ******** outstanding at the time of heating obtained by carrying out heating emulsification is shown, without blending natural cheese of 30% or less of a degree-of-ripeness index prepared again using lactic acid bacteria which produce a polysaccharide not less than 30%, and adding fused salt. This invention 30% or less of a degree-of-ripeness index prepared to low-fat milk using lactic acid bacteria which produce a polysaccharide, It is related with low-fat process cheese in which ******** outstanding at the time of heating obtained by carrying out heating emulsification

is shown, without a fat rate's blending 10 to 30% of natural cheese not less than 30%, and adding fused salt.

[0009]By using lactic acid bacteria which produce a polysaccharide as lactic acid bacteria in this invention, when manufacturing a stock cheese, In order for a polysaccharide produced by lactic acid bacteria to form a matrix as an adhering object into the surface of cheese curd generated in a cheesemaking process, and a card, to join together by an interaction of polysaccharide and water and to win moisture in cheese curd, Moisture discharged by heating at the time of whey exclusion decreases, and soft cheese curd of an organization having contained many moisture is obtained. A polysaccharide delays SHINERISHISU of cheese curd in order to check a casein comrade's binding in cheese curd morphosis. The water retention of cheese curd goes up by operation of such polysaccharide, and structure will become loose. Therefore, a cheese head which ripened this cheese curd contains many moisture, since an organization is also soft, even if it does not add fused salt, emulsification is performed good and process cheese obtained also becomes a smooth thing of an organization. In order to bring about such an effect, it is required in cheese curd to contain a polysaccharide 0.01% or more, and an effect is not acquired by less than it.

[0010]As mentioned above, ******** at the time of heating is dependent on strength of structure of casein in a cheese head, and ******** becomes good, so that structure of casein is firm. However, when many fused salt is added, ******** is made for it to be necessary to make quantity of fused salt added at the time of emulsification increase, or to make many moisture contain, when a cheese head with a structure of casein firm in this way is used, and to fall. Natural cheese manufactured on the other hand using lactic acid bacteria which produce a polysaccharide contains many moisture, it can fully emulsify, without adding fused salt, even if structure of casein is firm, if this cheese head is used since the organization is soft, and a good thing of ******** is obtained.

[0011]

[Embodiment of the Invention]Hereafter, this invention is explained in detail. The stock cheese used by this invention can be prepared as follows. First, milk fat of milk It adjusts to 0.5 to 4%, sterilizes at 63-75 **, it settles after that, cools to 30 **, and raw material milk is prepared. Here, if it is milk usually used for cheesemaking as "milk", which milk may be used, for example, whole milk, fat regulation milk, recombined milk, concentrated milk, butter milk, cream, or these mixtures can be mentioned.

[0012]To this raw material milk, they are about 0.05 to 4 % of the weight, and milk coagulating enzyme about a lactic starter. It adds 0.001 to 0.01% of the weight, milk is solidified at the temperature of 29-34 **, and cheese curd is obtained. in addition -- a lactic starter may be added for milk before sterilizing -- or the time of rennet addition -- warming in the case of whey exclusion -- the time -- the time of salting -- the time of mold stuffing, etc. -- proper -- it can

carry out . As "lactic acid bacteria", as long as it is lactic acid bacteria which produce a polysaccharide, which lactic acid bacteria may be used here, For example, Lactobacillus helveticus (Lactobacillushelveticus), Lactobacillus DERUBURUKKI Subspecies bulgaricus (Lactobacillus delbrueckiisubsp. bulgaricus), Lactococcus lactis Subspecies Clemeau Rith (Lactococcus lactissubsp.cremoris) etc. can be used. As such lactic acid bacteria, they are Lactobacillus helveticus SBT2171 (accession number FERM P-10053) and Lactococcus lactis, for example. Subspecies Clemeau Rith SBT0495 (accession number FERM P-14381) etc. can be illustrated. In addition, it is usable if commercial lactic acid bacteria are also lactic acid bacteria which produce a polysaccharide. Can also use together the lactic acid bacteria usually used for manufacture of a cheese head, and to such lactic acid bacteria. Lactococcus lactis Subspecies RAKUCHISU (Lactococcus subsp.lactis), Lactococcus lactis subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris), Leuconostoc SHITOROBORUMU (Leuconostoccitrovorum), etc. can be mentioned. As "milk coagulating enzyme", as long as it is milk coagulating enzyme usually used for manufacture of a cheese head, which milk coagulating enzyme may be used, and substitution rennet, transgenics rennet, etc. which were obtained from an animal, for example, a pig, and a microorganism, or vegetation besides rennet can also be used.

[0013]Subsequently, the obtained cheese curd is cut, for example so that it may become an about 10-40-mm-wide cube, quiet stirring is added, and SHINERISHISU (condensation) of cheese curd is promoted. Eliminating some whey produced when cheese curd was cut, and continuing stirring further, cheese curd is warmed at 30-38 **, and the whole quantity of the remaining whey is eliminated. Subsequently, salting is performed. As for salting, it may be preferred to consider it as 1 to 2% to the weight of cheese curd, and any of direct salting and brine salting may be sufficient as the salting method. After salting, a making machine is filled up with cheese curd and it is squeezed. Squeezing can be performed using the pressurization mold usually used in manufacture of a cheese head, a cautious type, or a vacuum type pressing machine. Subsequently, to 5 **, it cools and cheese curd is ripened. Aging can be performed by the same method as the usual natural cheese for one to six months at the temperature of 5-15 **.

[0014]Although the stock cheese of this invention can be manufactured as mentioned above, in this invention, the cheese head of 30% or less of a degree-of-ripeness index is used not less than 30%. The "degree of ripeness" (soluble nitrogen (STN) / total nitrogen (TN)) is what is called a degree-of-ripeness index (%) shown by x100 here. A degree-of-ripeness index measures the quantity of the total nitrogen contained in a cheese head, and soluble nitrogen in accordance with the following methods, and should just compute it based on the above-mentioned formula. Measurement of total nitrogen extracts the cheese head 10g, for example, adds 40 ml of 0.5N sodium acid citrate to it, is moved to a measuring flask after grinding for 5

minutes with a gay blender, and adds distilled water. The volume is set at 200 ml and let this be a sample solution. 10 ml of sample solutions can be extracted and it can measure with a Kjeldahl method. With distilled water after measurement of soluble nitrogen adds 10 ml of chloride of 1.41N to 10 ml of sample solutions The volume can be set at 125 ml, the generated protein sediment can be filtered, 10 ml of filtrate can be extracted, and soluble nitrogen can be measured with a Kjeldahl method. Since oil-off will be produced at the time not only of the structure of casein collapsing and sufficient ******** for the process cheese obtained not being given but emulsification if the degree-of-ripeness index of a stock cheese exceeds 30%, it is not desirable. In this invention, low-fat process cheese can be obtained by using raw material milk at the time of manufacturing a stock cheese as low-fat milk. It will be preferred to adjust to the fat rate of raw material milk and 0.5 - 1.4 %, and the fat rate of the cheese head prepared using such low-fat milk will be 10 to 30%.

[0015]Subsequently, process cheese is manufactured by using the obtained natural cheese as a stock cheese. What is necessary is just to perform manufacture of process cheese in accordance with a publicly known method except not adding fused salt. For example, heating emulsification is kneaded and carried out by 30 - 3000 revolution per minute, feeding into an emulsion machine the stock cheese manufactured using the lactic acid bacteria which produce a polysaccharide as mentioned above, and heating to 70 - 100 **. At this time, publicly known emulsion machines, such as a kettle type, the Stephen type, and a thermostat cylinder type, can be used for an emulsion machine. Subsequently, a container can be suitably filled up with the obtained emulsified matter, and the process cheese of this invention can be obtained by carrying out cooling shaping. As for shaping, limitation in particular does not have tabular, block like shape, rod form, etc.

[Translation done.]

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EXAMPLE

[Example]
[Work example 1](1) Manufacture of a stock cheese (usually cheese head of a fat rate)
It selected two shares of six shares at a time from the three following strains among the lactic acid bacteria which produce a polysaccharide, and six sorts of stock cheeses were manufactured by making each of these stocks into a lactic starter. The used strain Lactobacillus helveticus (Lactobacillus helveticus) (SBT2171) (SBT23670), Lactobacillus DERUBURUKKI Subspecies bulgaricus (Lactobacillus delbrukiisubsp.bulgaricus) (SBT30089), It is (SBT30110) Lactococcus-lactis subspecies Clemeau Rith (Lactoccus lactissubsp.cremoris) (SBT25066) (SBT45226). After carrying out the several generation subculture of six shares of above-mentioned lactic acid bacteria in accordance with a conventional method, single bacillus culture was carried out as a starter. Fat regulation milk (fat content 3.0 % of the weight) sterilized at 75 ** for 15 seconds is cooled at 30 **, It is Lactococcus lactis as a lactic starter used for the usual cheesemaking. Subspecies RAKUCHISU (Lactococcuslactissubsp.lactis) 0.5% and the above-mentioned lactic starter It adds 0.5% respectively, Furthermore, it added, and gently, it stirred, rennet (made in KURICHAN Hansen; HA LA RENNET POWDER) was settled, and cheese curd was obtained. Cheese curd was shredded to die shape with the curd knife with a width of tooth of 10 mm, and whey was eliminated, heating and stirring gently until the temperature of goods became 38 **. Then, it was immersed in the salt of 20% concentration after pressing the obtained cheese curd, and was made to ripe for three months at 10 **. When the degree of ripeness of the obtained cheese head was checked, each degree-of-ripeness index was 15%.
[0017](2) Blending six sorts of natural cheese manufactured by manufacture (1) of process cheese at 0, 10, 20, 30, and 40 or 50% of the weight of a rate, respectively, using the cheddar cheese of 20% of a degree-of-ripeness index, the remainder considered it as 1000 kg of whole quantity, and obtained the stock cheese. Having supplied this to the kettle type emulsion

machine, and stirring by 200 revolutions per minute, for about 10 minutes, heating emulsification was performed so that 85 ** might be made to reach, the emulsified matter was obtained, carton was filled up, it cooled in the refrigerator and process cheese was obtained.
[0018]
[Comparative example 1] As lactic acid bacteria, it is Lactococcus lactis. 0.5% and rennet were added for subspecies RAKUCHISU (Lactococcuslactissubsp.lactis), and the cheese head was prepared according to working example 1. The degree-of-ripeness index of the cheese head was ripened for three months so that it might become 15%. Process cheese was manufactured for the remainder as Cheddar cheese of 20% of a degree-of-ripeness index, using the obtained cheese head 30%. Fused salt was not added at this time.
[0019]
[The example 1 of an examination] About the process cheese manufactured by working example 1 and the comparative example 1, evaluation of emulsifying aptitude and ******** and organic-functions evaluation (smoothness and flavor of an organization) were performed. The method of evaluation is shown below. Since the comparative example 1 did not add fused salt, emulsification was not performed good.
[0020]Emulsifying aptitude; the state of oil-off when a cheese head is emulsified was observed visually. What produced (O) and oil-off for the good thing of the emulsified state was made into (x).
********; ******** was performed by two kinds of methods shown below.
(I) The sauce for pizzas was thinly applied to the bread (5 cm x 5 cm) sliced to sandwiches, 10g of things [SHUREDDO / the cheese head of working example 1 / things / 0.5cmx1.5cm x0.2cm] were carried, and it heated for 2 minutes and 30 seconds within the oven of 240 **. After taking out from oven and settling for 30 seconds, this was cut in the half, it pulled mutually, and the state of the cheese head at that time was observed. The evaluation was performed on the following standard. Evaluation A: Many thread is also pulled finely and it is extended well. Evaluation B: Although some evaluation C:****** which do not pull many thread finely, either, although good ****** is shown are accepted, they have insufficiency and no evaluation D:******.
[0021](II) The cheese head 20g is extracted on a petri dish, by induction heater (90 **), this was heated for 1 minute and melting was carried out. Then, the petri dish was taken out promptly, it pulled up at the speed of 10 cm/s after 30-second neglect using hauling measuring apparatus, and length until thread snaps was measured. This examination was repeated 5 times and the maximum of these measured value was made into the central value. Length until it is the evaluations A and B and thread snaps by (II) by (I) from the above-mentioned (I) and the measurement result of (II) made rejection (x) what does not fulfill success (O) and this condition for a thing of 30 cm or more.

[0022]organic-functions evaluation; -- I get 30 persons' panelist to eat process cheese cheese-head 10g every -- the smoothness and the flavor of an organization -- five point: -- very desirable four point: -- desirable three point: -- two point: which is not which, either -- it is not desirable -- is not [one : / five-step] very preferred evaluating -- the average mark -- a table -- the bottom. The 2nd place of the decimal point was rounded off. The above result is shown in Table 6 from Table 1.

[0023]

[Table 1]

Lactobacillus helveticus (SBT 2171) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	1.9
10	×	×	2.2	2.0
20	×	×	2.3	2.1
30	○	○	3.3	3.1
40	○	○	4.7	4.6
50	○	○	4.8	4.5

[0024]

[Table 2]

Lactobacillus helveticus (SBT 23670) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.0	1.9
10	×	×	1.8	1.9
20	○	○	2.3	2.1
30	○	○	3.3	3.1
40	○	○	4.7	4.7
50	○	○	4.8	4.6

[0025]

[Table 3]

Lactobacillus delbrueckii subsp. bulgaricus (SBT 30089) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.0	2.1
10	×	×	2.2	1.9
20	○	○	2.3	2.1
30	○	○	3.3	3.2
40	○	○	4.8	4.8
50	○	○	4.7	4.7

[0026]

[Table 4]

Lactobacillus delbrueckii subsp. bulgaricus (SBT 30110) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	2.2
10	×	×	1.9	2.0
20	×	×	2.4	2.2
30	○	○	3.2	3.1
40	○	○	4.8	4.8
50	○	○	4.7	4.7

[0027]

[Table 5]

Lactococcus lactis subs. cremoris (SBT 25066) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	2.2
10	×	×	1.9	2.0
20	○	○	2.4	2.2
30	○	○	3.2	3.1
40	○	○	4.8	4.8
50	○	○	4.7	4.7

[0028]

[Table 6]

Lactococcus lactis subs. cremoris (SBT 45226) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	1.9	2.2
10	×	×	2.0	2.1
20	○	○	2.2	2.3
30	○	○	3.2	3.2
40	○	○	4.7	4.8
50	○	○	4.8	4.6

[0029]

[Work example 2](1) Manufacture of a stock cheese (low-fat cheese head)

Through and the rate of milk fat to a separator fresh milk. It prepared so that it might become 1.0%. According to working example 1, fat manufactured 10% of stock cheese by making this into raw material milk. The used lactic acid bacteria were ripened for three months using Lactobacillus helveticus (Lactobacillus helveticus (SBT 2171)). The degree-of-ripeness index of the obtained cheese head was 15%.

[0030](2) 50% and a cheddar cheese (32% of fat rate) were added 50%, and the low-fat natural cheese (10% of fat rate) manufactured by manufacture (1) of process cheese was used as the stock cheese of 1000 kg of whole quantity. Process cheese was manufactured by the same method as (2) of working example 1.

[0031]

[The example 2 of an examination] Emulsifying aptitude, ********, the smoothness of an organization, and the valuation method same about flavor as the example 1 of an examination estimated. A result is shown in Table 7.

[0032]

[Table 7]

	評価項目			
	乳化適性	糸曳き性	風味	組織
本発明品	○	○	4.6	4.8

[0033]

[Work example 3](1) The natural cheese used as a raw material by the same method as manufacture working example 1 of a stock cheese was prepared. The used lactic acid bacteria used Lactobacillus helveticus (Lactobacillus helveticus (SBT 2171)). It was made to ripe at this time, so that the degree-of-ripeness index of a cheese head may be 20%, 25%, 30%, and 35%.

[0034](2) Blending the manufacture profitable **** natural cheese of process cheese 30%, the remainder obtained the stock cheese of 1000 kg of whole quantity using the cheddar cheese. Heating emulsification was carried out by the same method as working example 1, and process cheese was manufactured.

[0035]

[The example 3 of an examination] Emulsifying aptitude, ********, the smoothness of an organization, and the valuation method same about flavor as the example 1 of an examination estimated. The above result is shown in Table 8.

[0036]

[Table 8]

	評価項目			
熟度	乳化適性	糸曳き性	風味	組織
20	○	○	4.7	4.8
25	○	○	4.6	4.9
30	○	○	3.8	3.9
35	×	×	2.5	2.4

[Translation done.]

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(54)【発明の名称】　プロセスチーズ及びその製造方法

(57)【要約】
【課題】　溶融塩を含有せず、加熱時に優れた糸曳き性を示し、滑らかな組織及び風味の良いプロセスチーズ及びその製造法の提供。
【解決手段】　多糖を産生する乳酸菌を用いて調製した熟度指標30%以下のナチュラルチーズを、他のチーズに30%以上配合し、溶融塩を添加せずに加熱乳化してプロセスチーズを製造する方法。このようにして得られたプロセスチーズ。チーズの原料乳として低脂肪乳を用いて低脂肪プロセスチーズを得ることができる。溶融塩に由来するリンの過剰摂取を防ぐことができ、品質のよいプロセスチーズを得ることができる。

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【特許請求の範囲】

【請求項１】　多糖を産生する乳酸菌を用いて調製した熟度指標30%以下のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することを特徴とする加熱時に優れた糸曳き性を示すプロセスチーズの製造方法。

【請求項２】　低脂肪乳に、多糖を産生する乳酸菌を用いて調製した熟度指標30%以下、脂肪率が10～30%のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することを特徴とする加熱時に優れた糸曳き性を示す低脂肪プロセスチーズの製造方法。

【請求項３】　多糖を産生する乳酸菌を用いて調製した熟度指標30%以下のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することにより得られる加熱時に優れた糸曳き性を示すプロセスチーズ。

【請求項４】　低脂肪乳に、多糖を産生する乳酸菌を用いて調製した熟度指標30%以下、脂肪率が10～30%のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することにより得られる加熱時に優れた糸曳き性を示す低脂肪プロセスチーズ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、溶融塩を添加することなく、加熱乳化して得られる滑らかな組織を有し、風味も良好で、加熱時に優れた糸曳き性を示すプロセスチーズ及びその製造方法に関する。

【０００２】

【従来の技術】プロセスチーズは、原料となるナチュラルチーズを粉砕し、これにリン酸ナトリウム等の溶融塩を添加し、加熱乳化して均質な乳化物を調製し、冷却することにより得られる。乳化時に添加する溶融塩のナトリウムイオンがナチュラルチーズのカゼイン凝固に介在したカルシウムイオンと交換され、カゼインのつながりを分断する。ここで適度な加温と撹拌を与えることにより、蛋白質と脂肪が均一に混合される。このように、従来からプロセスチーズの製造では、粉砕したナチュラルチーズを加熱乳化する際に、脂肪と蛋白質の乳化を促進させると共に乳化状態を安定化させる目的で、溶融塩を添加している。溶融塩を添加せずにプロセスチーズを製造する方法も報告されている（真清、Snow Brand R&D Report 96,225 (1992)）が、溶融塩を添加せずに製造したプロセスチーズは、食べたときの食感が滑らかさに欠け、もろくて硬い組織となりやすく、製造の際にも乳化状態が不安定となり、脂肪分離や離水が生じやすい。そのため、従来からプロセスチーズの製造では、溶融塩を添加することが必須である。

【０００３】一方で、栄養学上、カルシウムの吸収は、カルシウム：リンのバランスがある一定の範囲で良好であるが、リンの摂取量が増えることにより、カルシウム：リンのバランスが崩れると、カルシウムの吸収が妨げられるという報告（H. H. Draper and C. A. Scythes, Fed. Proc., 40, 2434 ('81)）もある。従って、溶融塩、特にリン酸塩の使用量を抑えることが栄養学的にも望まれている。

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【０００４】また、プロセスチーズは滑らかな組織と良好な風味、さらに加熱調理した際の良好な溶融性や糸曳き性等の機能特性を有することから、その需要も堅調に伸びている。プロセスチーズに加熱時の良好な糸曳き性等の機能特性を付与するには、原料チーズとして熟度の低いチーズを用いるか、乳化の際に添加する溶融塩の添加量を少なくすればよい。チーズの糸曳き性は、チーズ中に存在するカゼインの構造の強さに依存しており、熟成の進行や溶融塩の添加によってカゼインの構造が壊れると、糸曳き性も低下する。従って、熟度の低い原料チーズを用いてプロセスチーズを製造すると、良好な糸曳き性は付与できる。しかしながら、このようにして得られるプロセスチーズは、風味の乏しいチーズとなる。一方で、熟度の高い原料チーズを用いてプロセスチーズを製造すると、風味の豊かなチーズは得られるが、糸曳き性は低下する。さらに、溶融塩の添加量を少なくすれば、良好な糸曳き性は付与できるが、乳化時に脂肪分離や離水が生じやすくなる。

【０００５】また、近年、国民一人当たりの脂肪摂取量の増加にともなって、成人病（生活習慣病ともいわれている）の発症率が増加している。このことから、脂肪の摂り過ぎは好ましくなく、プロセスチーズにおいても脂肪含量の低いものが市販されているが、これら低脂肪タイプのプロセスチーズは組織が脆く、硬くなり滑らかさに欠ける傾向がある。

【０００６】

【発明が解決しようとする課題】このような現状において、プロセスチーズには(1) 加熱調理時に良好な糸曳き性を示すこと、(2) 溶融塩を使用しないこと、(3) 風味、組織が良好であること、さらに (4)低脂肪であることが求められているが、そのようなプロセスチーズは未だ提供されていない。従って、本発明は溶融塩を添加することなく、加熱乳化して調製したプロセスチーズであって、加熱時に良好な糸曳き性、良好な風味及び組織を有するプロセスチーズ及びその製造方法を提供することを課題とする。また、本発明は溶融塩を添加することなく、加熱乳化して調製した低脂肪のプロセスチーズであって、上記と同様な特性を有する低脂肪のプロセスチーズ及びその製造方法を提供することを課題とする。

【０００７】

【課題を解決するための手段】本発明者らは、上記課題を解決するために鋭意研究を行なった結果、プロセスチーズ製造の際に使用する原料チーズに着目した。すなわち、原料チーズとして多糖を産生する乳酸菌を用いて調製したナチュラルチーズを用いることにより、溶融塩を

添加しなくとも乳化が良好に行なわれ、しかも得られたプロセスチーズが加熱時に良好な糸曳き性を示し、風味、組織の良好なプロセスチーズとなることを見いだした。さらに、低脂肪乳を用いて上記乳酸菌を添加して、調製されるナチュラルチーズを用いても、溶融塩を添加しなくとも乳化が良好であり、糸曳き性、風味、組織の良好な低脂肪プロセスチーズが得られることを見いだした。

【０００８】本発明は、多糖を産生する乳酸菌を用いて調製した熟度指標30%以下のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することを特徴とする加熱時に優れた糸曳き性を示すプロセスチーズの製造方法に関する。本発明は、また低脂肪乳に、多糖を産生する乳酸菌を用いて調製した熟度指標30%以下、脂肪率が10～30%のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することを特徴とする加熱時に優れた糸曳き性を示す低脂肪プロセスチーズの製造方法に関する。本発明はまた、多糖を産生する乳酸菌を用いて調製した熟度指標30%以下のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することにより得られる加熱時に優れた糸曳き性を示すプロセスチーズに関する。本発明は、また低脂肪乳に、多糖を産生する乳酸菌を用いて調製した熟度指標30%以下、脂肪率が10～30%のナチュラルチーズを30%以上配合し、溶融塩を添加することなく、加熱乳化することにより得られる加熱時に優れた糸曳き性を示す低脂肪プロセスチーズに関する。

【０００９】本発明では、原料チーズを製造する際に乳酸菌として、多糖を産生する乳酸菌を用いることにより、乳酸菌により産生される多糖がチーズ製造過程で生成されるチーズカードの表面及びカード中に粘着物としてマトリックスを形成し、多糖類と水との相互作用により結合してチーズカード中の水分を抱き込むため、ホエー排除時の加熱により排出される水分が少なくなり、水分を多く含んだ組織の軟らかいチーズカードが得られる。また、多糖はチーズカード形成過程においてカゼイン同志の結着を阻害するため、チーズカードのシネリシスを遅延させる。このような多糖類の作用によりチーズカードの保水性が上がり、構造がゆるやかなものとなる。従って、このチーズカードを熟成させたチーズは、水分を多く含有し、組織も軟らかいため、溶融塩を添加しなくとも乳化が良好に行なわれ、得られるプロセスチーズも組織の滑らかなものとなる。このような効果をもたらすためには、チーズカード中に多糖を0.01%以上含有することが必要であり、それ以下では、効果は得られない。

【００１０】また、前述のように、加熱時の糸曳き性はチーズ中のカゼインの構造の強さに依存しており、カゼインの構造が強固であるほど、糸曳き性は良好になる。しかしながら、このようにカゼインの構造が強固なチーズを用いた場合、乳化時に添加する溶融塩の量を増加させるか、又は水分を多く含有させる必要が生じるが、溶融塩を多く添加すると、糸曳き性を低下させることになる。一方、多糖を産生する乳酸菌を用いて製造したナチュラルチーズは、水分を多く含有し、組織が軟らかいため、このチーズを用いるとカゼインの構造が強固であっても溶融塩を添加することなく、十分に乳化が可能であり、糸曳き性の良好なものが得られる。

【００１１】

【発明の実施の形態】以下、本発明について詳しく説明する。本発明で使用する原料チーズは、以下のようにして調製することができる。まず、乳の乳脂肪を 0.5～4%に調整し、63～75℃で殺菌し、その後静置して30℃まで冷却して原料乳を調製する。ここで、「乳」としては、チーズ製造に通常用いられている乳であればいずれの乳を使用してもよく、例えば全乳、脂肪調節乳、還元乳、濃縮乳、バターミルク、クリーム又はこれらの混合物を挙げることができる。

【００１２】この原料乳に、乳酸菌スターターを約0.05～4重量%と凝乳酵素を 0.001～0.01重量%添加し、29～34℃の温度において、乳を凝固させ、チーズカードを得る。なお、乳酸菌スターターは、殺菌する前の乳に添加してもよく、又はレンネット添加時、ホエー排除の際の加温時、加塩時、型詰め時等適宜に行うことができる。ここで、「乳酸菌」としては、多糖を産生する乳酸菌であれば、いずれの乳酸菌を使用してもよく、例えば、ラクトバチルス・ヘルベティカス（Lactobacillus helveticus）、ラクトバチルス・デルブルッキー サブスピーシーズ・ブルガリカス（Lactobacillus delbrueckii subsp. bulgaricus）、ラクトコッカス・ラクチス サブスピーシーズ・クレモリス（Lactococcus lactis subsp. cremoris）等を使用することができる。このような乳酸菌としては、例えば、ラクトバチルス・ヘルベティカスSBT2171(受託番号FERM P-10053)、ラクトコッカス・ラクチス サブスピーシーズ・クレモリスSBT0495(受託番号FERM P-14381) 等を例示することができる。このほか市販の乳酸菌も多糖を産生する乳酸菌であれば使用可能である。また、通常チーズの製造に使用されている乳酸菌を併用することもでき、このような乳酸菌には、ラクトコッカス・ラクチス サブスピーシーズ・ラクチス（Lactococcus subsp. lactis）、ラクトコッカス・ラクチスサブスピーシーズ・クレモリス（Lactococcus lactis subsp. cremoris）、ロイコノストック・シトロボルム（Leuconostoc citrovorum）等を挙げることができる。「凝乳酵素」としては、チーズの製造に通常用いられる凝乳酵素であればいずれの凝乳酵素を使用してもよく、レンネットの他、動物、例えば豚、微生物又は植物から得られた代用レンネットや遺伝子組み換えレンネット等を使用することもできる。

【００１３】次いで、得られたチーズカードを、例え

ば．幅約10～40mmの立方体になるようにカッティングし．穏やかな撹拌を加えて．チーズカードのシネリシス（凝縮）を促進させる。チーズカードをカッティングした際に生じたホエーの一部を排除し．さらに撹拌を続けながら、チーズカードを30～38℃で加温し、残りのホエーの全量を排除する。次いで加塩を行なう。加塩は、チーズカードの重量に対して．１～２％とするのが好ましく．加塩方法は直接加塩．ブライン加塩のいずれでもよい。加塩後、チーズカードを成形機に充填して．圧搾する。圧搾は、チーズの製造において通常用いられる加圧型．自重型または真空型のプレス機を用いて行なうことができる。次いで、チーズカードを５℃まで冷却し、熟成させる。熟成は温度５～15℃で１～６カ月間．通常のナチュラルチーズと同様の方法で行なうことができる。

【００１４】なお、前述のようにして本発明の原料チーズを製造することができるが、本発明では、熟度指標30％以下のチーズを30％以上用いる。ここで「熟度」とは．(可溶性窒素(STN)/全窒素(TN)) ×100 で示されるいわゆる熟度指標（％）のことである。熟度指標は、チーズ中に含有される全窒素及び可溶性窒素の量を以下の方法に従って測定し、上記の計算式に基づいて算出すればよい。全窒素の測定は．例えばチーズ10g を採取し、それに0.5Nクエン酸ナトリウム40mlを加え、ホモブレンダーで５分間磨砕後、メスフラスコに移し、蒸留水を加えて 200mlに定容し、これを試料液とする。試料液10mlを採取し、ケルダール法で測定することができる。可溶性窒素の測定は．試料液10mlに1.41N の塩酸を10ml加えた後．蒸留水で 125mlに定容し、生成した蛋白沈殿物を濾過し、濾液10mlを採取しケルダール法で可溶性窒素を測定することができる。なお原料チーズの熟度指標が30％を越えると．カゼインの構造が崩れ．得られるプロセスチーズに十分な糸曳き性を付与することができないばかりか、乳化時にオイルオフを生じるため、好ましくない。また、本発明では、原料チーズを製造する際の原料乳を低脂肪乳とすることで低脂肪のプロセスチーズを得ることができる。原料乳の脂肪率は．0.5～1.4 %に調整するのが好ましく、このような低脂肪乳を用いて調製されるチーズの脂肪率は10～30%となる。

【００１５】次いで、得られたナチュラルチーズを原料チーズとして．プロセスチーズを製造する。プロセスチーズの製造は．溶融塩を添加しないこと以外、公知の方法に従って行なえばよい。例えば、前述のように多糖を産生する乳酸菌を用いて製造した原料チーズを乳化機に投入し、70～100 ℃に加熱しながら．30～3000回転／分で混練して加熱乳化する。このとき乳化機は、ケトル型．ステファン型、サーモシリンダー型等の公知の乳化機を用いることができる。次いで、得られた乳化物を適宜容器に充填し．冷却成形することにより本発明のプロセスチーズを得ることができる。成形は、板状．ブロック状．棒状等．特に限定はない。

【００１６】

【実施例】

【実施例１】（１）原料チーズの製造（通常脂肪率のチーズ）

多糖を産生する乳酸菌のうち、次の３菌種から２株ずつ６株を選定し．これらの株それぞれを乳酸菌スターターとして６種の原料チーズを製造した。用いた菌株はラクトバチルス・ヘルベティカス（Lactobacillus helveticus）(SBT2171)(SBT2367G)．ラクトバチルス・デルブルッキー　サブスピーシーズ・ブルガリカス（Lactobacillus delbrukii subsp. bulgaricus)(SBT30089),(SBT30110)、ラクトコッカス・ラクチス・サブスピーシーズ・クレモリス（Lactococcus lactis subsp. cremoris)(SBT25066),(SBT45226）である。常法に従い、上記乳酸菌６株を数代継代培養した後．スターターとして単菌培養した。75℃で15秒間殺菌した脂肪調節乳（脂肪含有率3.0重量％）を30℃に冷却し、通常のチーズ製造に用いている乳酸菌スターターとしてラクトコッカス・ラクチス　サブスピーシーズ・ラクチス（Lactococcus lactis subsp. lactis）を 0.5%及び上記乳酸菌スターターを0.5%づつ添加し、さらにレンネット（クリチャン　ハンセン社製；HA LA RENNET POWDER)を添加して緩やかに撹拌．静置してチーズカードを得た。チーズカードを刃幅10mmのカードナイフでサイコロ状に細断し、品温が38℃となるまで緩やかに加熱撹拌しながら、ホエーを排除した。その後．得られたチーズカードをプレス後．20%濃度の食塩中で浸漬し、10℃で３カ月間熟成させた。得られたチーズの熟度を確認したところ．それぞれの熟度指標は15%であった。

【００１７】（２）プロセスチーズの製造

(1) で製造した６種のナチュラルチーズをそれぞれ0、10．20、30、40．50重量%の割合で配合し、残りは熟度指標20%のチェダーチーズを用い、全量1000kgとし、原料チーズを得た。これをケトル型乳化機に投入し．200回転／分で撹拌しながら．約10分間．85℃に到達させるように加熱乳化を行ない．乳化物を得．カートンに充填し．冷蔵庫内で冷却してプロセスチーズを得た。

【００１８】

【比較例１】乳酸菌として．ラクトコッカス・ラクチス　サブスピーシーズ・ラクチス（Lactococcus lactis subsp. lactis）を 0.5%及びレンネットを添加し．実施例１に従ってチーズを調製した。なお．チーズの熟度指標は15%となるように３カ月間熟成させた。得られたチーズを30%用い．残りを熟度指標20%のチェダーチーズとして、プロセスチーズを製造した。この時、溶融塩は添加しなかった。

【００１９】

【試験例１】実施例１及び比較例１で製造したプロセスチーズについて．乳化適性及び糸曳き性の評価と官能評価（組織の滑らかさと風味）を行なった。評価の方法は

以下に示す。なお、比較例１は溶融塩を添加しなかったため、乳化が良好に行われなかった。

【００２０】乳化適性；チーズを乳化したときのオイルオフの状態を目視で観察した。乳化状態の良好なものを（○）、オイルオフを生じたものを（×）とした。

糸曳き性；糸曳き性は、次に示す２通りの方法で行なった。

(I) サンドイッチ用にスライスした食パン(5cm×5cm)にピザ用ソースを薄く塗り、実施例１のチーズを 0.5cm×1.5cm ×0.2cm にシュレッドしたものを10g のせ、240 ℃のオーブン内で２分30秒間加熱した。オーブンから取り出し30秒間静置した後、これを半分に切って互いに引っ張り、その時のチーズの状態を観察した。その評価は下記の基準で行った。評価Ａ：細かく何本もの糸を曳き、良く伸びる。評価Ｂ：良好な糸曳きを示すが、細かく何本もの糸を曳かない。評価Ｃ：糸曳きは多少認められるが不十分。評価Ｄ：糸曳きなし。

【００２１】(II)チーズ20g をシャーレに採取し、これを＊

＊を電磁加熱器（90℃）で１分間加熱し、溶融させた。その後、直ちにシャーレを取り出し30秒放置後、引っ張り測定機を用いて毎秒10cmの速度で引き上げ、糸が切れるまでの長さを測定した。この試験を５回繰り返し、これらの測定値の最大値を代表値とした。上記(I)、(II)の測定結果から、(I) で、評価Ａ又はＢであり、かつ(II)では糸が切れるまでの長さが30cm以上のものを合格（○）、この条件を満たさないものを不合格（×）とした。

【００２２】官能評価；プロセスチーズを30名のパネラーにチーズ10g ずつ食してもらい、組織の滑らかさ及び風味について、５点：大変好ましい、４点：好ましい、３点：どちらでもない、２点：好ましくない、１点：大変好ましくないの５段階　で評価し、その平均点で表した。なお、小数点第２位を四捨五入した。以上の結果を表１から表６に示す。

【００２３】

【表１】

Lactobacillus helveticus (SBT 2171) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.1	1.9
10	×	×	2.2	2.0
20	×	×	2.3	2.1
30	○	○	3.8	3.1
40	○	○	4.7	4.6
50	○	○	4.8	4.5

【００２４】

※ ※【表２】

Lactobacillus helveticus (SBT 23670) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.0	1.9
10	×	×	1.8	1.9
20	○	○	2.3	2.1
30	○	○	3.9	3.1
40	○	○	4.7	4.7
50	○	○	4.8	4.6

【００２５】

★ ★【表３】

Lactobacillus delbrueckii subsp. bulgaricus (SBT 30089) 配合割合（%）	評価項目			
	乳化適性	糸曳き性	風味	組織
1	×	×	2.3	2.1
10	×	×	2.2	1.9
20	○	○	2.8	2.1
30	○	○	3.3	3.2
40	○	○	4.8	4.8
50	○	○	4.7	4.7

【００２６】

【表４】

Lactobacillus delbrueckii subsp. bulgaricus (SBT 20110) 配合割合（%）	評価項目 乳化適性	糸曳き性	風味	組織
1	×	×	2.1	2.2
10	×	×	1.9	2.0
20	×	×	2.4	2.2
30	○	○	3.2	3.1
40	○	○	4.8	4.8
50	○	○	4.7	4.7

【００２７】　＊　＊【表５】

Lactococcus lactis subs. cremoris (SBT 25046) 配合割合（%）	評価項目 乳化適性	糸曳き性	風味	組織
1	×	×	2.1	2.2
10	×	×	1.9	2.0
20	○	○	2.4	2.2
30	○	○	3.2	3.1
40	○	○	4.8	4.8
50	○	○	4.7	4.7

【００２８】　※　※【表６】

Lactococcus lactis subs. cremoris (SBT 45226) 配合割合（%）	評価項目 乳化適性	糸曳き性	風味	組織
1	×	×	1.9	2.2
10	×	×	2.0	2.1
20	○	○	2.2	2.3
30	○	○	3.2	3.2
40	○	○	4.7	4.6
50	○	○	4.8	4.6

【００２９】
【実施例２】（１）原料チーズの製造（低脂肪のチーズ）
生乳をセパレーターに通し、乳脂肪率が1.0%となるように調製した。これを原料乳として、実施例１に従って脂肪分が10%の原料チーズを製造した。なお、使用した乳酸菌はラクトバチルス・ヘルベティカス（Lactobacillus helveticus (SBT 2171)）を用い、３カ月熟成させた。得られたチーズの熟度指標は15%であった。

【００３０】（２）プロセスチーズの製造　★　★(1)で製造した低脂肪ナチュラルチーズ（脂肪率10%）を50%及びチェダーチーズ（脂肪率32%）を50%添加し、全量1000kgの原料チーズとした。実施例１の(2)と同様の方法でプロセスチーズを製造した。

【００３１】
【試験例２】乳化適性、糸曳き性、組織の滑らかさ、風味について試験例１と同様の評価方法で評価した。結果を表７に示す。

【００３２】　【表７】

	評価項目 乳化適性	糸曳き性	風味	組織
本発明品	○	○	4.6	4.8

【００３３】
【実施例３】（１）原料チーズの製造
実施例１と同様の方法で原料とするナチュラルチーズを調製した。使用した乳酸菌はラクトバチルス・ヘルベティカス（Lactobacillus helveticus (SBT 2171)）を用いた。この時、チーズの熟度指標が20%、25%、30%、35%となるように熟成させた。

【００３４】（２）プロセスチーズの製造
得られたナチュラルチーズを30%配合して、残りはチェダーチーズを用い、全量1000kgの原料チーズを得た。実施例１と同様の方法で加熱乳化し、プロセスチーズを製造した。

【００３５】
【試験例３】乳化適性、糸曳き性、組織の滑らかさ、風味について試験例１と同様の評価方法で評価した。以上の結果を表８に示す。

【００３６】　【表８】

	評価項目			
熟度	乳化適性	糸曳き性	風味	組織
20	○	○	4.7	4.8
25	○	○	4.6	4.9
30	○	○	3.8	3.9
35	×	×	2.3	2.4

【００３７】

【発明の効果】本発明によれば、加熱乳化時に溶融塩を添加しなくとも乳化が良好に行われ、加熱調理時に良好な糸曳き性を示し、組織、風味の良好なプロセスチーズを得ることができる。また、原料乳に低脂肪乳を用いても、溶融塩を使用しないで加熱乳化した加熱調理時に良好な糸曳き性し、風味、組織の良好な低脂肪のプロセスチーズを提供することができる。本発明のチーズは乳化時に溶融塩を添加しないので、リンの過剰摂取の傾向も抑制することができ、カルシウム：リンのバランスを一定の範囲に保つことが可能となる。